Notice No.1

Rules for the Manufacture, Testing and Certification of Materials, July 2019

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2019

Amendments to	**Effective date**	**IACS/IMO implementation (if applicable)**
Chapter 12, Section 2	1 January 2020	1 January 2020
Chapter 13, Section 2	1 January 2020	N/A

Lloyd's Register

Chapter 12
Welding Qualifications

■ *Section 2*
Welding procedure qualification tests for steels

2.12 Mechanical test acceptance criteria for steels

(Part only shown)

2.12.1 **Longitudinal all weld metal tensile test:**

(e) For base metal grades with minimum specified yield strength level of 890 and 960 N/mm^2, the weld metal strength may be lower than the minimum specified for the base metal provided that the application has design approval for the undermatching weld metal. In such cases the weld metal strength is not to be less than that specified in the approved design.

2.12.2 **Transverse tensile test:** The tensile strength measured from the transverse tensile test is not to be less than the minimum specified for the base material used in the test. For tanks intended for liquefied gases and for other types of assemblies for base metal grades with minimum specified yield strength level of 890 and 960 N/mm^2, a lower ultimate tensile may be accepted subject to design approval as in *Ch 12, 2.12 Mechanical test acceptance criteria for steels 2.12.1.(d)* and *Ch 12, 2.12 Mechanical test acceptance for steels 2.12.1.(e)* respectively.

(Part only shown)

2.12.4 **Impact toughness tests:**

(d) For quench and tempered steels, the required test temperature and absorbed energy are to be in accordance with that specified for the parent materials. For base metal grades with minimum specified yield strength level of 890 and 960 N/mm^2, the weld metal absorbed energy may be lower than the minimum specified for the base metal provided that the application has design approval for the undermatching weld metal. In such cases the absorbed energy is not to be less than that specified in the approved design.

Chapter 13
Requirements for Welded Construction

■ *Section 2*
Specific requirements for ship hull structure and machinery

2.10 Post-weld heat treatment

~~2.10.1 Post-weld stress relief heat treatment is applied to improve the fatigue performance or to improve resistance to brittle fracture and is generally required for carbon and carbon-manganese and low alloy steels under any of the following conditions:~~
~~(a) Where the material thickness exceeds 65 mm.~~
~~(b) For complicated weld joints where there are high stress concentrations.~~
~~(c) Where fatigue loads are considered high.~~

2.10.1 This Section determines the requirements for post-weld stress relief heat treatment when applied to ship structure and associated machinery.

2.10.2 Post-weld stress relief heat treatment is applied to improve resistance to brittle fracture or fatigue performance. It is to be applied when the thickness limits stated in *Table 13.2.4 Post-weld stress relief heat treatment thickness limits* are exceeded.

Table 13.2.4 Post-weld stress relief heat treatment thickness limits

Typical Application	**Load Conditions (*See* Note 1)**	**Material Grade (*See* Note 2)**	**Material Thickness Limit (mm) (*See* Note 3)**
Ship structure	Fatigue non-critical/critical	Normal strength (A–E), Higher strength (H27S–H40, excluding EH47)	150
Ship structure	Fatigue non-critical/critical	Higher strength (EH47)	100
Machinery	Fatigue non-critical	High strength (H42–H69)	140
Machinery	Fatigue critical	High strength (H42–H46)	100
Machinery	Fatigue critical	High strength (H50–H69)	65
Ship structure/machinery	Any	Other material grades	Subject to special consideration
Note 1. Fatigue analysis shall be approved by design appraisal according to relevant rules for each application. (a) Fatigue non-critical – Design assessment confirms that there are cyclic stresses but the fatigue life is reasonably greater than the design fatigue life and it is anticipated that fatigue crack initiation and propagation are unlikely to occur. (b) Fatigue critical – Design assessment confirms that there are cyclic stresses and the estimated fatigue life meets the design requirements but it is not significantly higher. It is anticipated that fatigue crack initiation and propagation are likely to occur. Note 2. Where steel grades based on national and international standards are specially agreed for construction, they are to be procured from LR approved works which hold current approval for the LR equivalent grade and the same delivery condition as the steel to be procured. Note 3. For all applications where material thickness is greater than 65 mm (or greater than 100 mm for EH47), 100 per cent surface and volumetric non-destructive examination of welds is required.			

Existing Tables 13.2.4 to 13.2.6 have been renumbered 13.2.5 to 13.2.7.

~~2.10.2~~ 2.10.3 Post-weld heat treatment is to be applied to the following types of welded construction:
(a) Welding of steel castings where the thickness of the casting at the weld exceeds 30 mm, except where castings are directly welded to the hull structure:
(b) Engine bedplates except for engine types where the bedplate as a whole is not subjected to direct loading from the cylinder pressure. For these types, only the transverse girder assemblies need to be stress relieved;
(c) Welding of gear wheels;
(d) Welding of gear cases associated with main or auxiliary engines, *see Pt 5 Main and Auxiliary Machinery*.

2.10.4 Consideration is to be given to applying post-weld heat treatment for all thicknesses of complicated weld joints where there are high stress concentrations.

~~2.10.3~~ 2.10.5 Where required, heat treatment is to be performed in accordance with the requirements specified in ~~*Ch 13, 4.10 Postweld heat treatment for pressure vessel construction*~~ *Ch 13, 1.16 Post-weld heat treatment* and *Table 13.4.3 Post-weld soak temperatures and times*.

~~2.10.4~~ 2.10.6 Special consideration may be given to omit the required post-weld heat treatment. Evaluation is to be based on critical engineering assessment involving fracture mechanics testing and proposals are to be submitted which include full details of the application, materials, welding procedures, inspection procedures, design temperature and stresses, fatigue loads and cycles. Evidence will be required to demonstrate that the inspection techniques and procedures to be employed are able to detect flaws ~~down~~ to the sizes and tolerances (of length, through-wall height and through-wall position), as determined from the fracture mechanics (and or fatigue) calculations. Alternative procedures for the omission of post weld heat treatment will be subject to special consideration.

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